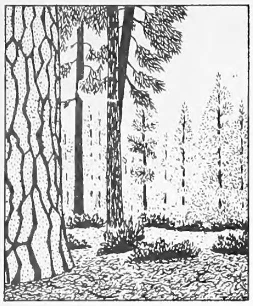

FOREST RESEARCH NOTES
CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
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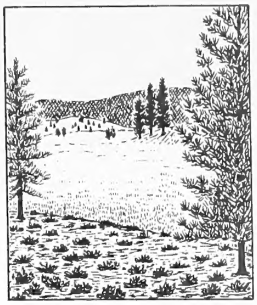

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PLANTING PONDEROSA PINE IS A GOOD INVESTMENT

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Is planting forest trees a good investment? This is a pertinent question in California because of the need for well stocked forest lands to maintain forest industry and the lack of natural regeneration on large acreages of land best suited to timber production. To help answer the question for operating forest properties, we have determined what the present worth of future timber harvests would be at the time ponderosa pine plantations were established. The analysis was based on the following five assumptions:

1. The ponderosa pine yield tables[1/] give reasonable estimates of the expected volumes per acre for fully stocked managed stands even though the size and number of trees will differ from the yield table data.

2. The utilization standards specified in the yield table for the stand 6.6 inches in diameter and larger (International 1/8-inch rule) will be realized.

3. The diameters attained in managed stands will be greater than in wild stands owing to more rapid growth after intermediate harvest cuts.

4. Stumpage prices will at least equal those shown in table 1.

5. A reduction of 25 percent in yields or receipts will provide an adequate allowance for adverse factors such as incomplete stocking and unsalvageable mortality.

[1/] Meyer, Walter H. 1938. Yield of even aged stands of ponderosa pine. U. S. Dept. Agr. Tech. Bul. 630, 59 pp., illus.

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To determine yield from the plantation, the average diameter in the stand was estimated for selected site indexes and age classes (table 1). Diameter estimates were based on data from wild stands,[2/] thinning studies, and other growth studies. For the youngest age on each site, the diameter is the expected average diameter of the leave trees; for all other ages it is the expected average diameter of both cut and leave trees. The expected number of trees per acre for all ages except the youngest on each site was computed by dividing the yield table volume per acre by the volume of a tree of the estimated diameter.

In estimating the volume of the intermediate harvests it was reasoned that all but the computed number of trees for the next age would be cut. Intermediate harvests are a significant part of the assumed method of management. They reduce the investment, increase total yield by salvaging many trees that would die before the final harvest, and encourage faster growth on the remaining trees.

The present worth of the intermediate and final yields (table 2) was computed by use of appropriate compound interest tables. Besides the 25 percent allowance for adverse factors, the cost of pruning selected crop trees, discounted to the time of planting, also was subtracted from the total value. On managed forest properties most fixed and current operating costs, for example, for roads and fire protection, are not increased as a result of improving the stocking by planting. Consequently the direct outlays for planting and pruning, and the interest charges against them, are the only charges that need to be assessed against the plantation yields. Therefore the data in table 2 show the maximum amounts that can be spent for planting and site preparation and still earn the indicated interest rates.

As an example, planting cost can be taken as $70 per acre. This is about the average for planting stock, site preparation, and setting out the trees in the pilot-plant operation at Blacks Mountain Experimental Forest. At $70 per acre, planting ponderosa pine would yield an interest rate of 6 percent for site A-200, 5 percent for site I-175, 4 percent for site II-150, 3 percent for site III-125, and less than 2 percent for site IV-100. The breaking point for 2 percent is between sites III-125 and IV-100.

[2/] List of material. Forest Management Field Course. Unpublished report by Duncan Dunning, California Forest and Range Experiment Station, July 1, 1951.

Table 1.--Basic data used in analysis of planting investment

Age (Years)	Site index 60			Site index 70			Site index 80		
	Average d.b.h.	Volume cut per acre	Stumpage per M	Average d.b.h.	Volume cut per acre	Stumpage per M	Average d.b.h.	Volume cut per acre	Stumpage per M
	Inches	Bd.-ft.	Dollars	Inches	Bd.-ft.	Dollars	Inches	Bd.-ft.	Dollars
50	8	1/ 1,085	10	9	1/ 2,955	10	10	1/ 3,850	10
60	10	1,290	20	11	3,120	20	12	5,220	20
80	13	2,640	20	15	2,800	20	16	7,280	20
100	16	1,820	20	18	4,680	30	20	31,200	40
120	19	2,870	30	21	27,700	40	--	--	--
140	22	24,400	40	--	--	--	--	--	--
	Site index 100			Site index 120			Site index 140		
30	--	--	--	--	--	--	9	1/ 17,075	10
40	9	1/ 9,770	10	10	1/ 20,610	10	14	23,320	20
60	15	11,280	20	18	17,500	30	22	18,800	30
80	20	40,200	40	24	62,200	40	28	88,700	40

1/ Calculated in cords and converted to board-feet at the rate of 2 cords per M board-feet.

Table 2.--Present value[1] [2] per acre of intermediate and final harvests of ponderosa pine plantations

Site index[3]	Present value at indicated interest rate						Rotation
	2%	2½%	3%	4%	5%	6%	
	Dollars						Years
60 (IV-100)	65	35	--	--	--	--	140
70	114	67	46	19	--	--	120
80 (III-125)	177	113	73	31	--	--	100
100 (II-150)	323	225	158	78	40	--	80
120 (I-175)	--	394	279	143	75	40	80
140 (A-200)	--	--	468	257	146	86	80

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[1] Reduced by charges for pruning selected crop trees at the rate of 50 cents per tree, discounted to the present.

Site index 60: 40 trees at 50 years = $20 per acre;
70 and 80: 40 trees at 40 years = $20 per acre;
100 and 120: 50 trees at 30 years = $25 per acre;
140: 50 trees at 20 years = $25 per acre.

[2] Full earnings reduced 25 percent to take care of incomplete stocking and unsalvageable mortality.

[3] Site index at 100 years -- ponderosa pine yield table. Symbols in parenthesis indicate site quality according to Dunning, "A site classification for the mixed-conifer selection forests of the Sierra Nevada," California Forest and Range Experiment Station Research Note No. 28, 21 pp. (Processed). Dec. 1, 1942.

The interest rate used is perhaps the most important factor in determining present worth of plantation yields. Decreasing the interest rate by 1 percent approximately doubles the present worth at the time of planting. The stumpage price would have to be about doubled in order to make the same change in the present worth. Consequently, selection of an acceptable minimum interest rate is highly important in deciding whether or not to invest money in planting. The probable earnings on alternate long-term investments available to the land owner are the best guide. High earnings on stocks not available for purchase or subject to wide fluctuation obviously are not good guides for determining acceptable long-term interest rates. For example, the Federal government frequently borrows money at 2 percent. Therefore selection of a 2 percent rate for planting on national-forest land is appropriate. An important point to keep in mind is that young trees continue to grow regardless of economic ups and downs. Possible indirect values--such as in public relations, extension of employment for seasonal workers, and the assurance of future sources of raw material for large plants--may also influence the decision regarding the acceptable interest rate.

Then what is the answer to the question, "Is planting a good investment?" On the basis of this analysis, planting the better quality sites appears to be a good investment for almost any forest owner in California. On the lower sites planting is a good investment only for those who can and are willing to accept low rates of earnings.

No matter what interest rate is chosen, however, the planting and site preparation must be well done. Saving money in these jobs is pointless if too few trees are established to return the expected yields.